Planning and Analysis for the Middle Rio Grande Bosque Ecosystem Restoration Feasibility Study

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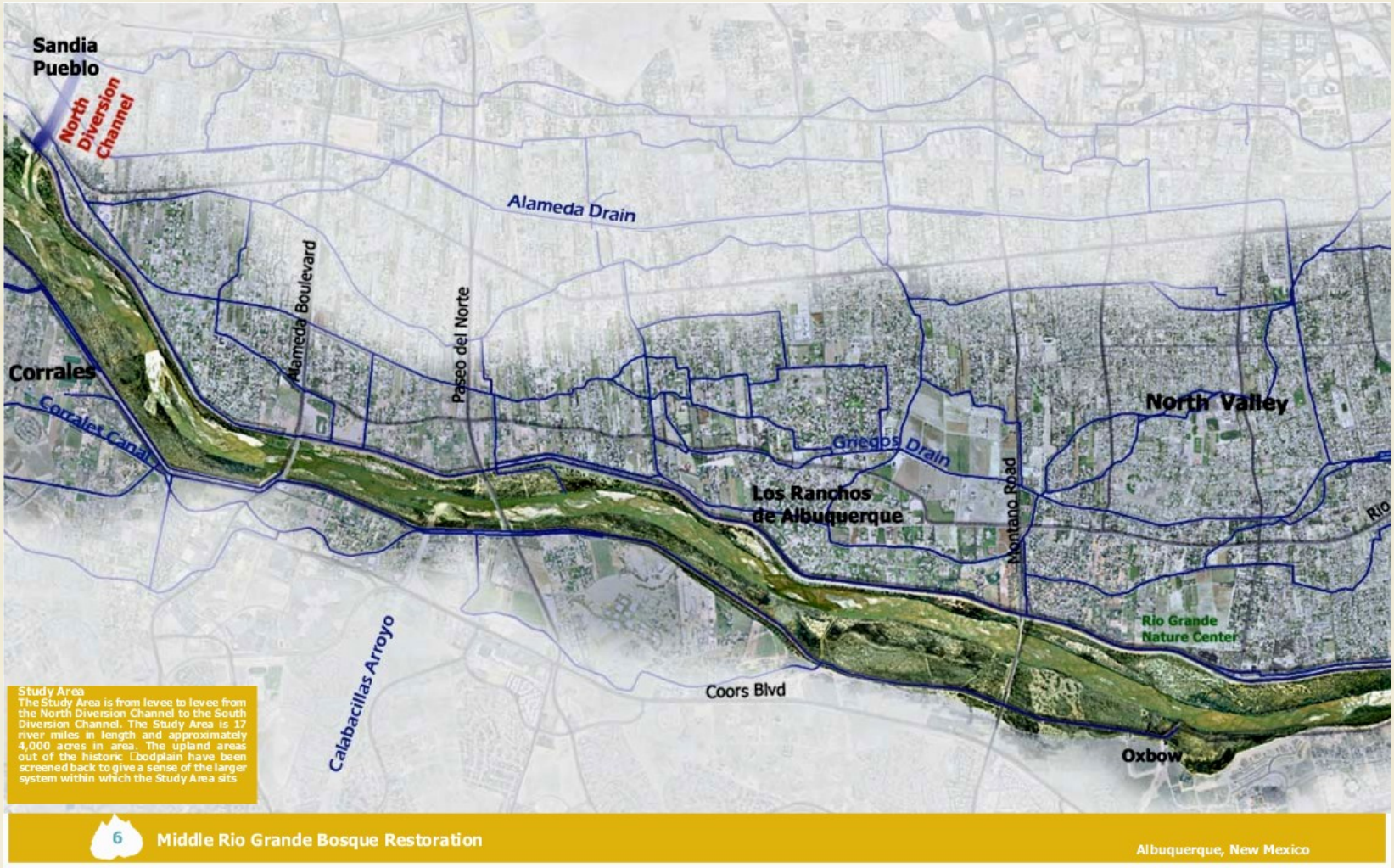
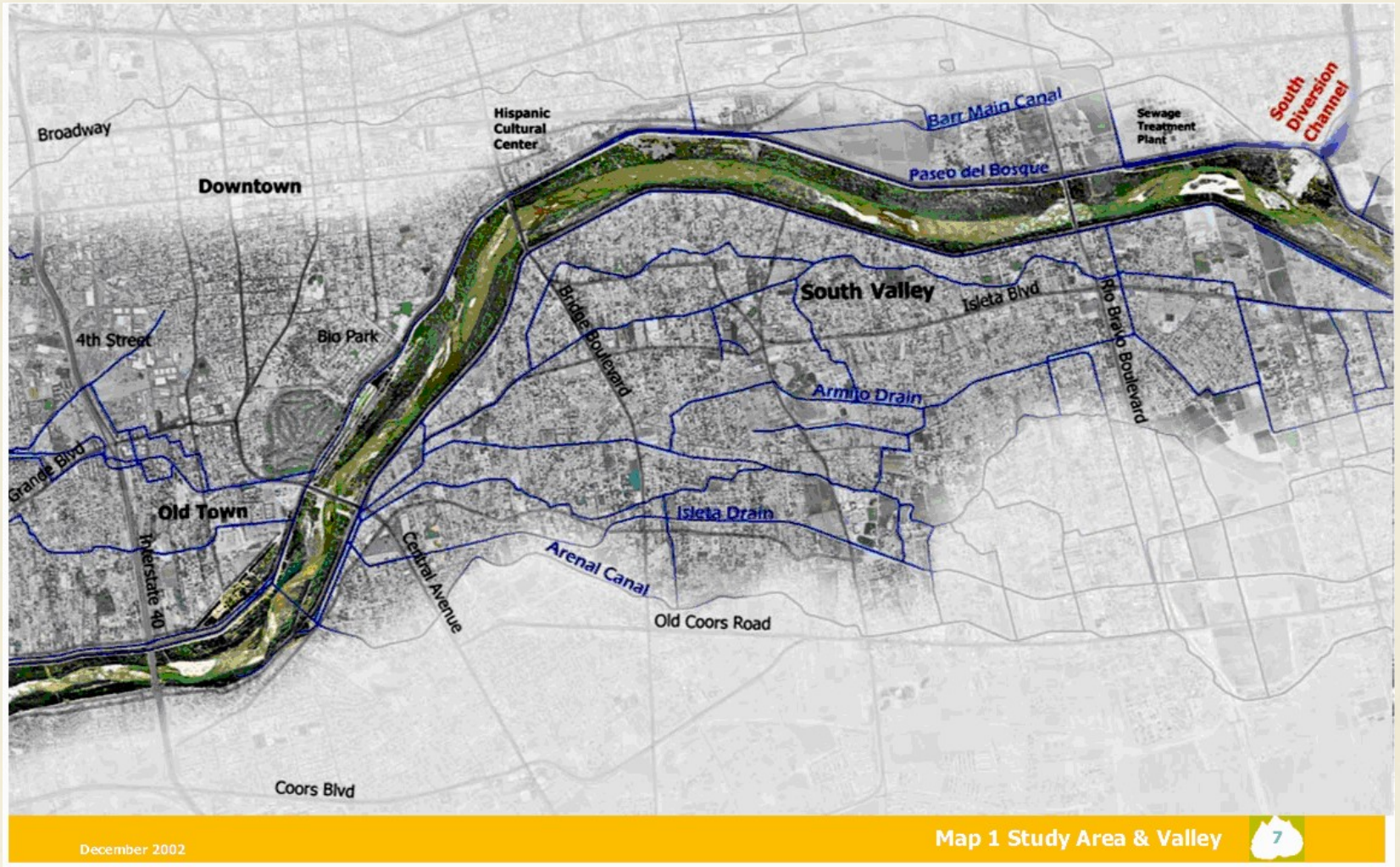
Project Description

- Authority – 2002 House of Representatives Resolution 107-258
- Location – Middle Rio Grande in the vicinity of Albuquerque, New Mexico.

Project Location


Sandia Pueblo
North Diversion Channel
Alameda Drain
Alameda Boulevard
Paseo del Norte
Corrales
Corralat Canal
Griegos Drain
Los Ranchos de Albuquerque
Montano Road
North Valley
Rio Grande Nature Center
Coors Blvd
Calabacillas Arroyo
Oxbow
Study Area
The Study Area is from levee to levee from the North Diversion Channel to the South Diversion Channel. The Study Area is 17 river miles in length and approximately 4,000 acres in area. The upland areas out of the historic floodplain have been screened back to give a sense of the larger system within which the Study Area sits

Project Location



Project Goals

- Extend and enhance native riparian communities within the bosque:
  - Reduce the number and size of nonnative dominant stands within the bosque;
  - Replant highly disturbed areas with native plant species (burn sites, dumps, and nonnative removal areas); and
  - Selectively remove nonnative understory plants and replant with native plants to create greater stand diversity (age, size and composition) and edge area.

Project Goals

- Extend and enhance wetland habitat in the bosque and the diversity of quality aquatic habitat in existing wetlands.

- Implement measures to rehabilitate fluvial processes in the bosque:
  - Remove non-functional jetty jacks;
  - Bank improvements;
  - Overbanking;
  - Side channel creation.

- Protect, extend and enhance areas of potential habitat for listed species within the existing bosque.

Project Goals

- Prevent catastrophic fires in the bosque through the reduction of fuel loads identified as hazardous.
- Develop and implement a long term O&M plan which incorporates long-term monitoring of proposed restoration treatments.
- Coordinate with other ongoing restoration and research efforts in the bosque.

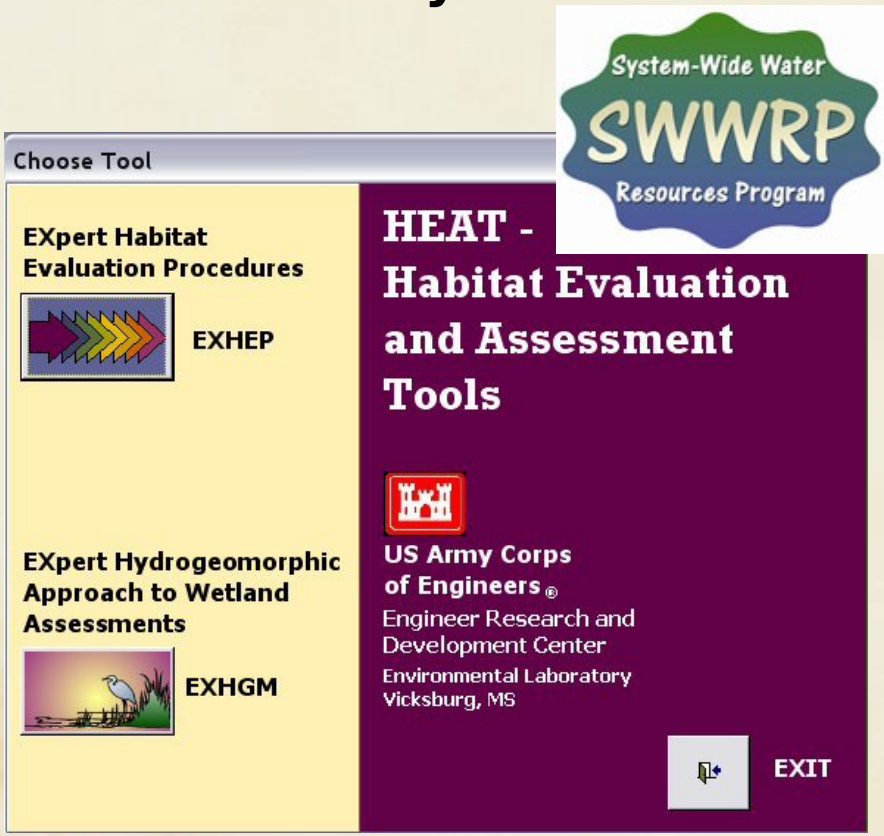
Ecosystem Assessment Process

1. **Define Project**
2. **Assemble Ecosystem Evaluation Team**
3. **Select, Modify and/or Create Evaluation Model**
4. **Conduct Field Sampling**
5. **Calculate Baseline Results**
6. **Develop Project Without Project Conditions**
7. **Calculate Without Project**
8. **Results**
9. **Develop Project With Project Conditions**
10. **Calculate With Project Results**
11. **Perform Tradeoffs**
12. **Compare Alternatives using Performance Targets and Cost Analysis**
13. **Select Recommended Plan**

ERDC Involvement

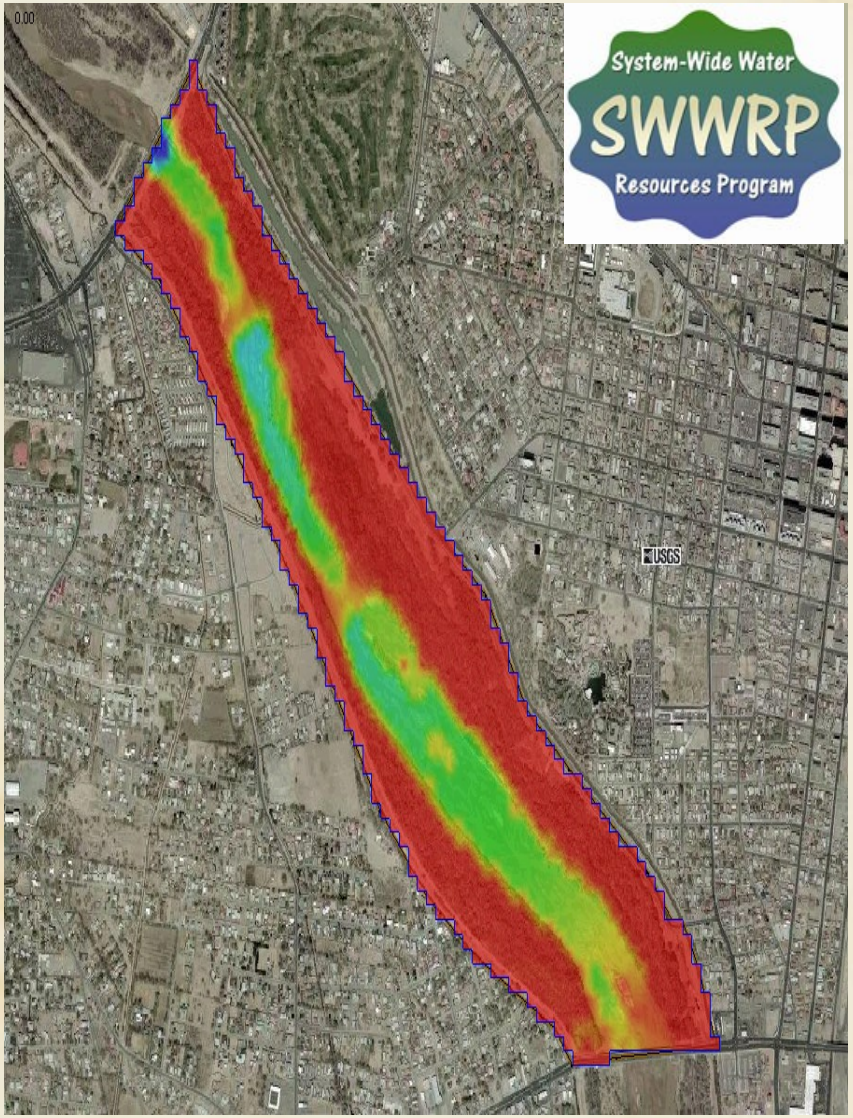
USACE Albuquerque District contracted with ERDC for: "Project Planning, Ecosystem Evaluation, and Incremental Cost Analysis"

- √ **Model Development including workshops, meetings, data management and data entry**
- √ **Baseline/Without-Project Analysis**
- √ **Training on Habitat Evaluation Assessment Tool (HEAT) software See System-wide Water Resources Research Program Booth**
- √ **Develop products to be used in EA**
- √ **Complete 1/3 of HEAT runs**
- √ **Perform Incremental Cost Analysis (ICA)**



Assessment effort to date

- **Functional Model Building Workshop held February 28 – March 4, 2005**
- **Field work completed by SPA mid-May through mid-July 2005**
- **Baseline Results and Without-Project Trends Meeting held August 18-19, 2005**
- **Initial Gridded Surface-Subsurface Hydrologic Analysis (GSSHA) - See System-wide Water Resources Research Program Booth**



Functional Model Building Workshop, Feb 28 – Mar 4

- **E-Team and Project Development Team (PDT) invited. Ten E-Team members will continue through the process – Middle Rio Grande Conservancy District, Open Space Division, USFWS, NM Dept. Game and Fish, University of New Mexico, New Mexico Natural Heritage Program, etc.**

- **Team received overview of HEP, HGM, Corps Planning Process, Model Development**

Functional Model Building Workshop

- E-Team developed Model components
- Used vegetation types defined for the Middle Rio Grande (Hink & Ohmart) and chose 10 (there are 6 types, we added treated/untreated/wet):
  - **Type 1, Type II Untreated (U), Type II Treated (T), Type III, Type IVU, Type IVT, Type V, Type VITDry (D), Type VIUD, Type VIWet (W)**

Functional Model Building Workshop

- Forest
  - What's important?
    - **Water**
    - **Biota**
    - **Soils**
    - **Landscape**
- Meadow

Mathematical Formulas

- Component = BIOTA

$$\frac{\left\{2 \times \left[\left(\left\{\frac{\left[\left(V_{CANTREE} \times V_{NATIVETREE}\right)^{1/2} \times V_{SIZETREE}\right] + \left(V_{CANSHRUB} \times V_{NATIVESHRB}\right) + \left(V_{CANHERB} \times V_{INDICATHB}\right)}{3}\right\}\right) \times V_{SPPCOUNT}\right]\right\} + V_{DEPTHOM} + V_{COVGRND}}{3}$$

$$\left[\frac{\left(V_{CANSHRUB} \times V_{NATIVESHRB}\right) + \left(V_{CANGRASS} \times V_{INDICATGR}\right) + \left(V_{CANFORB} \times V_{INDICATFB}\right) + \left(V_{CANSEDGE} \times V_{NATIVESDG}\right)}{4}\right] \times V_{SPPCOUNT}$$

Mathematical Formulas

- Component = WATER

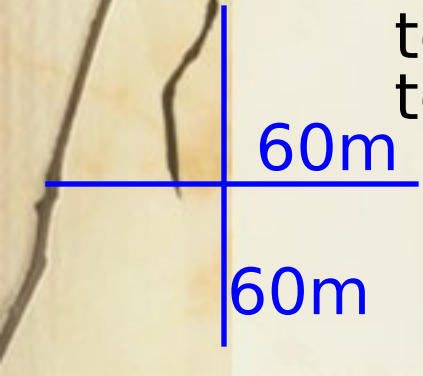
$$\frac{\left(V_{FLOODFREQ} \times V_{DURATION}\right)^{1/2} + \left(V_{DEPTHGW} \times V_{MACROTOPO}\right)^{1/2}}{2}$$

- Component = LANDSCAPE

$$\left[V_{PATCHSIZE} \times \left(V_{DISTPATCH} \times V_{TYPEPATCH}\right)^{1/2}\right]^{1/2} \times V_{TYPDISTURB}$$

Field Method Development

- Developed by Parametrix
- Ten different cover types; need at least 3 site samples for each type so 30 sites total
- Transect placed at each site: 60m x 60m (middle 10 m was not sampled to allow access) so 100 m total at each site = 300m total for each cover type



Field Methods

- **Canopy** - cover of shrubs, trees, and indicator species herbaceous plants
- **Ground cover** - soil, rock, litter, mulch, live basal vegetation, downed woody material
- **Density and basal stem diameter of native and non-native trees**
- **Density of native and non-native root-spouts**
- **Depth of organic material**
- **Presence/absence of macro-topographic features -** mounds, depressions

Field Methods, mid-May to mid-July, 2005

Point Center Quarter (PCQ)
-to measure trees at the end of each line, then measured the distance to the nearest tree and its basal stem diameter

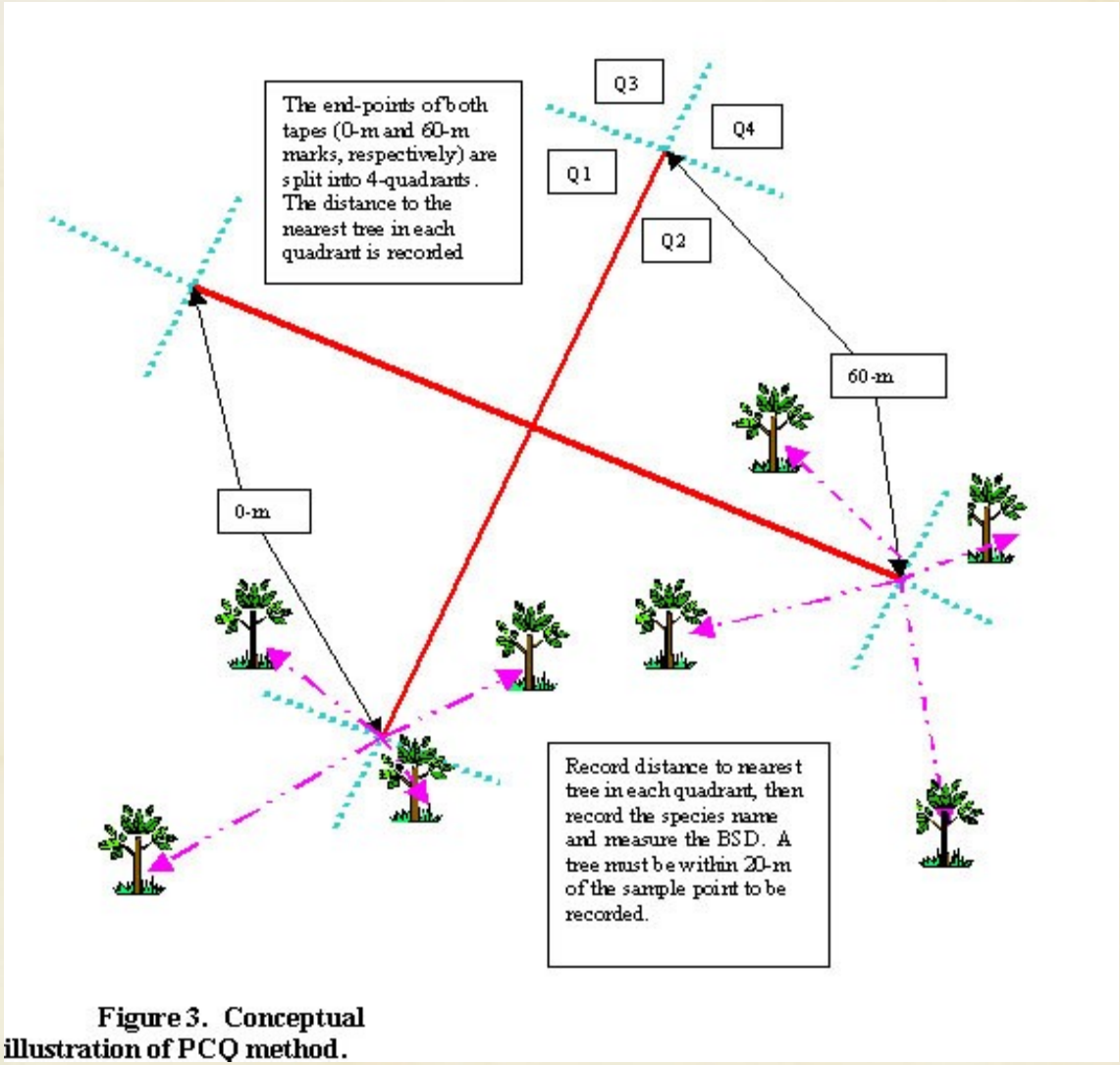
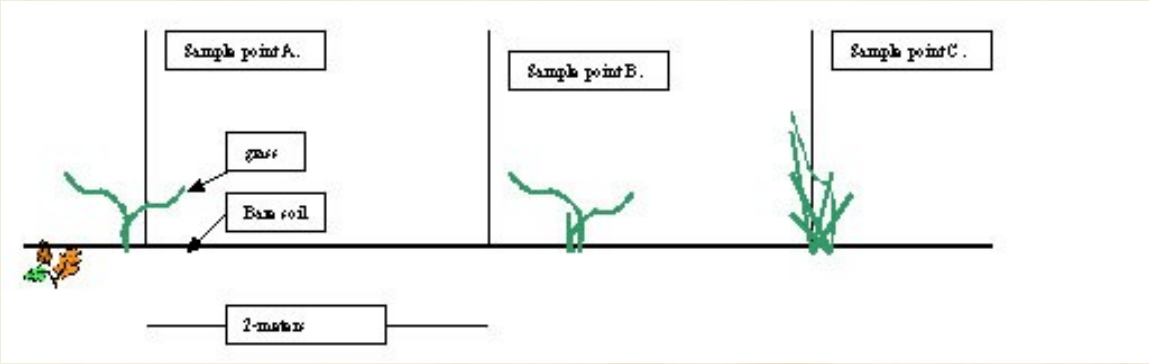

The end-points of both tapes (0-m and 60-m marks, respectively) are split into 4-quadrants. The distance to the nearest tree in each quadrant is recorded
Q1
Q2
Q3
Q4
0-m
60-m
Record distance to nearest tree in each quadrant, then record the species name and measure the BSD. A tree must be within 20-m of the sample point to be recorded.

Figure 3. Conceptual illustration of PCQ method.

Field Methods

- Every 2m, measured point-intercept for plants and used vertical densiometer for trees
  - Categories: bare soil, litter, mulch, live basal vegetation, small woody debris (< 3 in. diameter), large woody debris (> 3 in. diameter)

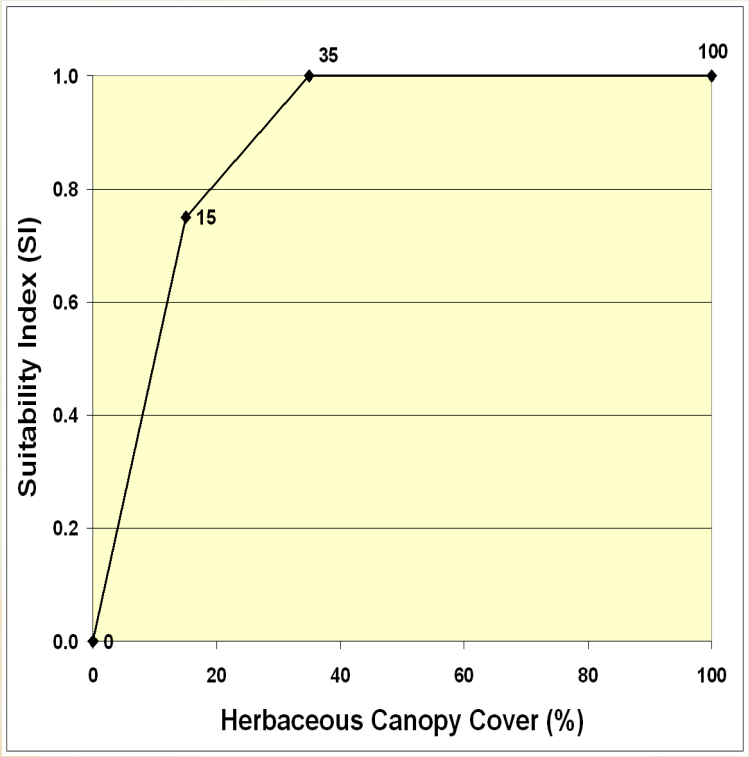


Field Methods

- Every 10m measured depth of organic matter (DOM) in centimeters with ruler
- Shrubs measured by line-intercept; start/stop
- Recorded Negative and Positive species indicators
- Noted macrotopography – channel, hill, etc.
- Measured depth to groundwater

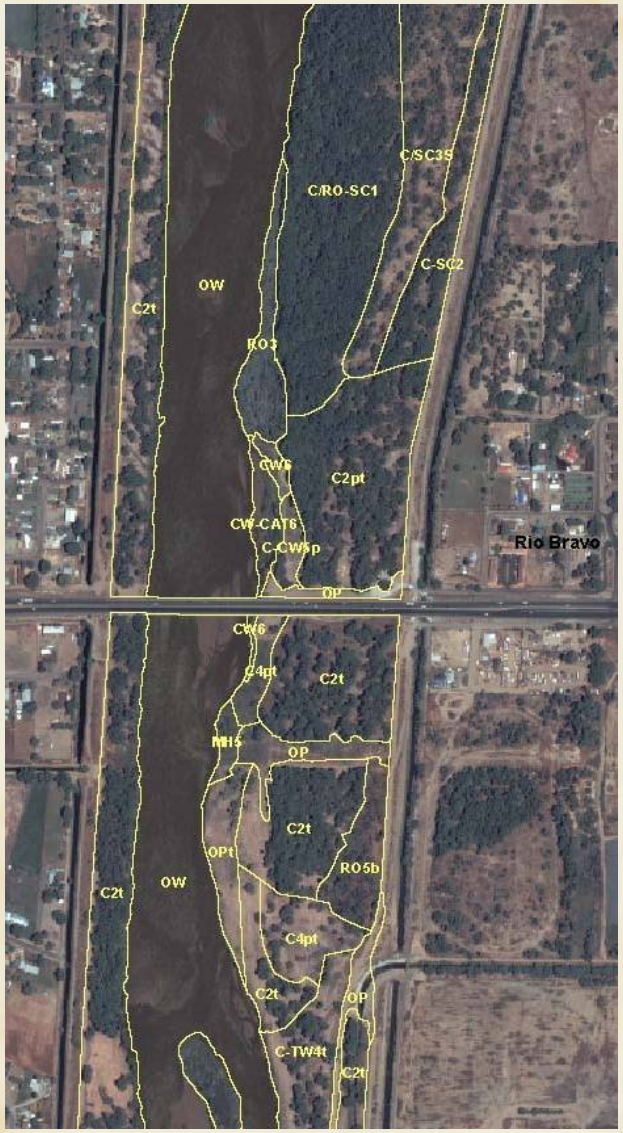
Field Analysis and Trends

- Entered information into formulas
- Also included hydrology information– flood frequency and duration
- Reviewed results August 18-19 with ERDC
- Made changes to Suitability Index's (SI)



Current Status

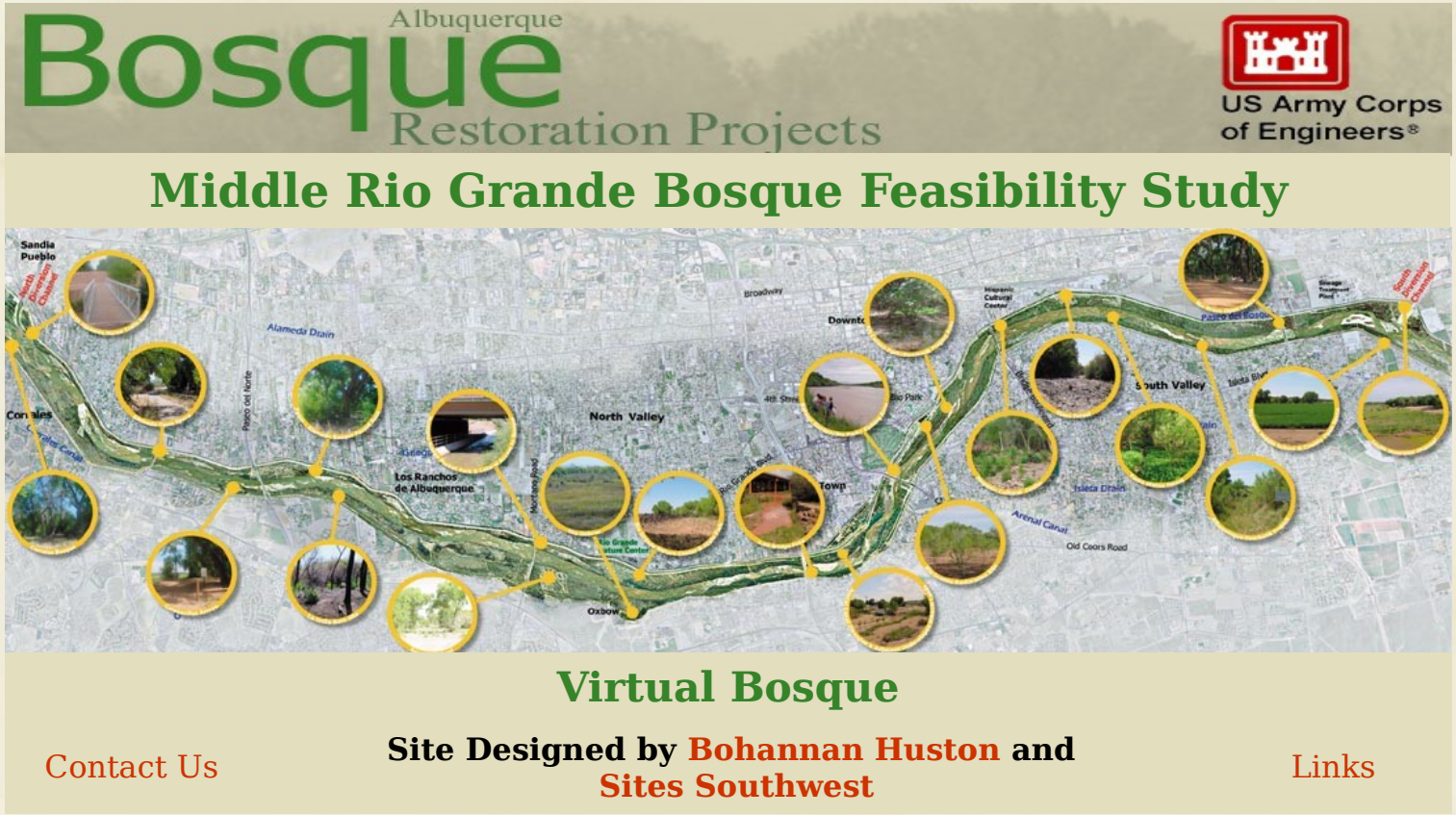
- **Just completed additional information to complete Baseline Conditions and Without Project analysis:**
  - **2005 Vegetation Survey**
  - **Final H&H information**
  - **Protocols – H&H and GIS information (distance to next patch, distance to disturbance, etc.)**
- **Revised Baseline Results and With-project Trends Meeting set for May ‘06**



Next Steps

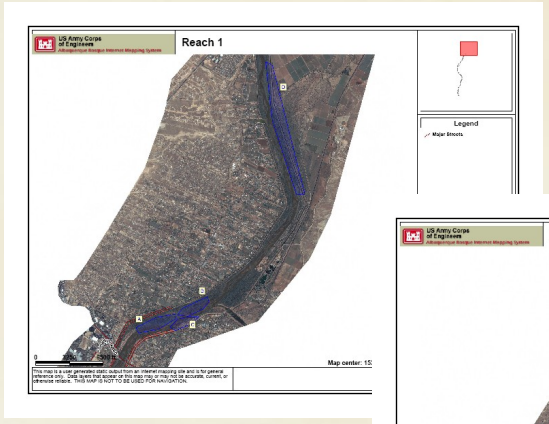
- Alternative development initiated using new tool: Albuquerque Bosque Internet Mapping System . . .

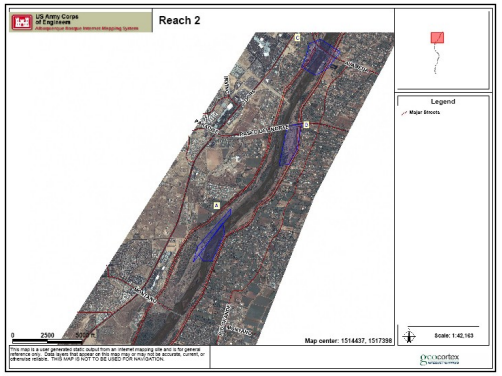
  www.bosquerevive.com

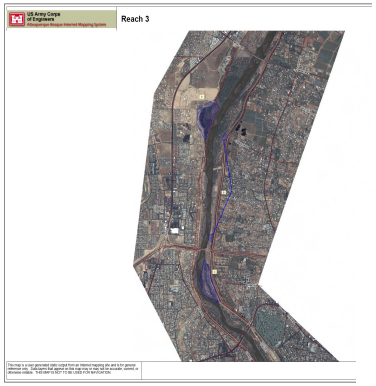


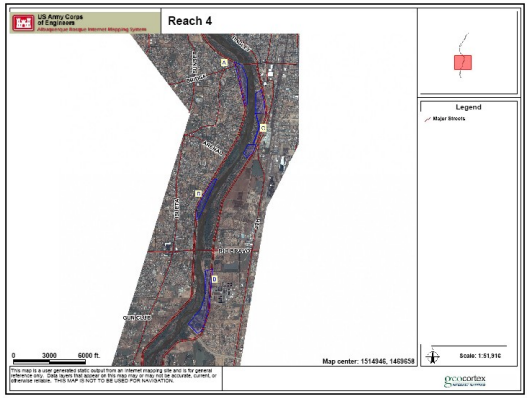
Next Steps

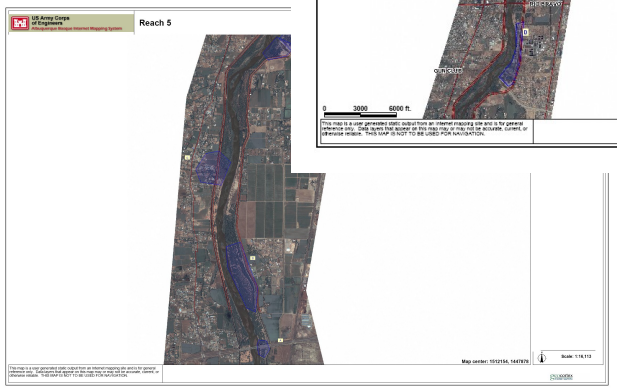
- Multiple Alternatives formulated per reach based on cover types, O&M and phasing
- Assess Alternatives with HEP model and GSSHA
- Compare Alternatives with CEA/ICA











Take Home Points

- **Coordinate with Stakeholders early & often.**
- **HEP Works!**
- **Don’t be afraid to build your own models - New technology (HEAT and GSSHA) can provide critical information for your study in a cost-effective manner through the Lab’s research programs – contact ERDC early on**
- **What you put into your model will reflect on what comes out of it!**